ROSE CULTURE IN CALIFORNIA

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Are You About to Plant a Rose Garden or Renovate an Old One?

Do you want to grow roses for your enjoyment or for exhibit? Whatever you have in mind, you will find yourself asking some of these questions:

What are the hybrids and their progeny?
What are the popular varieties?
What roses will grow in my climate?
How do I plant a rose bush?
How much water does it need and how often?
How are roses propagated?
How are they graded for sale?
What insects must be controlled?
What diseases should I look for?
How do I use sprays and dusts?
How are the different types of roses pruned?
When do I replace a declining bush?
How are exhibit roses grown and appraised?

Roses Will Grow Almost Anywhere in California

No matter what your climate, some varieties will be suitable. A rose zone map appears on page 37 of this circular. On page 38 is a list of some of the varieties adapted to each of the six zones.

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Rose Culture in California

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THE WILD ROSE was the first rose described as growing in California. Spanish settlers saw it along the trail from San Diego to San Francisco in 1769, and, probably in memory of the pink rose they had left in Spain—*Rosa damascena* var. *trigintapetala*—called it the Castilian rose. Later, upon settling, they imported the Castilian rose from the old country and planted it in the Mission and rancho gardens and in the cemeteries.

Eighty years later, settlers described two roses growing in California. One was the same pink Castilian rose of earlier days; the other was a white variety growing at Mission San Jose. Probably the latter was either the single White Cherokee or the Lamarque, both introduced in Europe in the early part of the nineteenth century.

When American nurserymen came to San Francisco in 1849, such popular roses as Austrian Copper (introduced in Europe at the end of the sixteenth century) and White Banksia (Europe in the early nineteenth century) were brought in. Among many others were Gloire des Rosomanes (Ragged Robin), Cloth of Gold (Chromatella), Gold of Ophir, Niphetos, and Fortune's Yellow, all introduced in Europe in the early part of the nineteenth century. Many of these varieties still grow in old California gardens.

The culture of roses in the state grew so rapidly that by 1856 Louis Prévost, a nurseryman at San Jose, listed some 20,000 rose plants for sale. By 1858, a San Francisco nurseryman, William C. Walker, grew between 400 and 500 rose varieties. By 1947, the value of rose production in the leading counties of the state was more than seven and a half million dollars. The total for each leading county appears in appendix table 1.

Roses have continued to be one of the most popular flowers in California home gardens, and interest has been kept high by the introduction of new varieties from year to year. Marechal Niel (introduced in 1864), La France (1867), American Beauty (1875), William Allen Richardson (1878), Cecile Brunner (1881), Papa Gontier (1883), Mme. Caroline Testout (1890), Frau Karl Druschki (1900), and many other varieties hold fond memories for the older rose fanciers.

What Are the Hybrids and Their Progeny?

Rose growers are interested primarily in the many rose hybrids and their progeny. Certain fanciers are interested only in rose species, even though such species as Banksia, Austrian Copper, *Rosa hugonis*, and *R. wichuraiana* are still grown in California gardens. Commercial growers are also interested in the wild stocks which have provided *R. multiflora* and *R. odorata*—the Chinese tea rose—or in hybrids between species, such as manetti.

Most rose hybrids and their progeny may be placed in certain large classes or groups. These are usually listed as hybrid tea, hybrid perpetual, tea, polyantha, noisette, Cherokee, Irish single, and miscellaneous.

Several years ago the hybrid perpetual, tea, and noisette were highly popular. The multiflora, the moss, and the pernettiana also claimed some interest, but at present hybrids in these groups are seldom grown.

The hybrid perpetual class was originated in 1835 by crossing the old Da-

mask perpetual with the Bourbon rose to secure a vigorous race. This cross is usually well represented by Frau Karl Druschki and occasionally by Paul Neyron and Ulrich Brunner. It is also represented by American Beauty.

The tea roses were named for their tea scent. Many roses of this group had a relatively weak habit of growth. Certain of these were Lady Hillingdon, Marechal Niel, and the various Cochet roses.

The noisette was noted for its vigorous climbing habit and ease of culture. It required little pruning. Cloth of Gold, Gold of Ophir (Ophirie), Lamarque, and William Allen Richardson are occasionally seen today in old gardens. They are representative of this class.

The multiflora group of roses includes the polyantha and some of the ramblers. Cecile Brunner, Baby Rambler, and Yellow Rambler are old varieties in this class. All are characterized by small flowers borne in clusters.

The moss roses get their name from the mosslike glands covering the sepals. These roses are particularly interesting in the bud, but not so in full bloom.

The pernettiana group, which resulted from a cross between Austrian Copper and one of the hybrid perpetuals, was represented by Juliet and Mme. Edouard Herriot.

The hybrid teas, developed mostly in the last forty years, have almost entirely replaced the tea roses. They were originated by crossing the tea roses with the hybrid perpetual roses. Mme. Butterfly of this group is still a popular rose (fig. 1). Charlotte Armstrong is another fine specimen of the hybrid teas (fig. 2).

More recently, certain briar blood characteristics, such as colors of old gold and flame red, were introduced from the pernettiana group. Hybrid tea roses were used later in some of the crosses. The intense copper in some of our modern hybrid teas is inherited from the Austrian briar.

The polyantha roses produce very small

Fig. 1.—Mme. Butterfly of the hybrid tea group has been a popular rose for many years.

flowers, often borne in clusters. Cecile Brunner in climbing form (fig. 3) and Etoile Luisante, in bush (fig. 4), illustrate this group very well.

The floribunda group includes certain roses formerly listed as hybrid teas or as hybrid polyanthas. This group includes the large-flowering polyanthas, such as Rosenelfe; and the low, compact-growing hybrid teas, such as Snowbird and World's Fair, which have flowers up to perhaps 4 inches in diameter, in a wide range of colors. Some of the newer varieties among the floribundas, such as Red Ripples (fig. 5) and Pinocchio, are meeting with great popularity. The long blooming period of hybrid teas makes them valuable for sprays and color effect.

There is still some interest in the Irish single roses, such as Irish Elegance, and the Cherokee roses, such as Pink Cherokee. Fortune's Yellow, a miscellaneous rose, is thought by some to be a hybrid between the Cherokee and the Banksia.

In California, Fortune's Yellow is known both as Beauty of Glazenwood and as San Rafael. One of the best climbing singles is Dainty Bess (fig. 6).

Ragged Robin of the Bourbon group is still a popular rose for planting around orchards. It is one of the best stocks on which to propagate roses.

Know the Popular Varieties

Beginners always want a list of some of the best modern roses to plant in the small home garden. Tables 2 to 7, in the appendix, contain this information.

The roses are divided into bush and climber. Many of the popular bush roses are listed in table 3. These are also grown as standard or tree roses, for use mainly in formal gardens or where space is limited. Some of the very popular climbing hybrid tea roses appear in table 4. Many of the most popular have been developed from bush roses by mutation.

In 1940 the yearly practice began of granting the All America Awards to the best introductions each year (see table 7). Rose fanciers have benefited by the consensus of sixteen competent judges throughout the United States.

Fig. 2.—One of the most popular of the All America Award roses is Charlotte Armstrong, a fine specimen of the hybrid teas.

Select Varieties Adapted to Climate

California has almost as many types of climate as may be found in the rest of the United States. This fact makes it difficult to say that any specific rose variety is adapted to the state. Some rose specialists have suggested defining six climatic areas and listing popular varieties adapted to each area. One such classification gives Beach, Coastal Plain, Transition, Inland, Desert, and Mountain as the primary zones. These form the zone map and list of certain rose varieties adapted to each zone, which are in the appendix.

There is no very distinct limit for the zones just mentioned, although some general outline may be given. The Beach area is exposed to the ocean along the California coast from San Diego County to northern California. In this area, 325 days of the year are normally above freezing, and the mean summer temperature ranges under 70 degrees F.

The Coastal Plain lies just back of the Beach area. Here, the summer temperatures are up to 75 degrees, with a normal range of 250 to 325 days above freezing. The cooling effect of the ocean is evident in the growth of roses, but the air is not so damp as in the Beach area.

The Transition zone lies between the Coastal Plain and the hot Inland area. This may be limited to certain islands on the map—for instance, where the rivers converge in central California or where citrus does well in some of the inland areas. A normal growing season of 200 to 275 days or more exists. The mean winter temperature is about 65 degrees, and the mean summer temperature may reach 75 to 80 degrees.

The Inland zone is exposed to high summer temperatures which often reach 100 degrees or higher. There are about 225 days or more above freezing.

The Desert area is limited to an inland zone of southern California where about 250 days or more are above freezing, and where the mean summer temperature reaches about 90 degrees. The mean winter temperature may be as high as 65 degrees, although the nights are cold.

Fig. 3.—The climbing polyantha, Cecile Brunner, produces very small pink flowers, often borne in clusters.

The Mountain area is confined to the higher elevations, where heavy freezes occur in winter and frosts may occur in almost any month in the year. There may be only 100 to 200 days above freezing during the year, which means a short growing season. In parts of the Mountain area, rose canes may be killed back unless a very hardy variety is planted, such as some of the *Rosa rugosa* hybrids.

It is possible, in one small publication, to classify only a few of the many varieties of roses adapted to these climatic zones. A local nursery can furnish the names of more varieties adapted to your climate.

Fig. 4.—The bush polyantha, Etoile Luisante, also produces very small flowers. The buds are flame colored.

Varieties which need a cool climate, or at least one not too hot, include Bright Wings, California, Diamond Jubilee, Floradora, Fred Edmunds, Mrs. Sam McGredy, Night, Nocturne, Eclipse, Poinsettia, Rubaiyat, Saturnia, and Sweet Sixteen. These develop their best color in the cooler climates. Peace also requires a cool climate for development of its best color. On the other hand, a variety such as Mirandy does best with heat and no fog. It is therefore well adapted to inland and desert areas, but is practically worthless near the coast.

Fortunately, many varieties seem to do well in any climate. These include Charlotte Armstrong, Condesa de Sastago, Joanna Hill, Lowell Thomas, Pinocchio, Signora, and Victoria Harrington.

Know How to Plant

The best time to plant roses in California extends from the middle of January on into February, or as long as healthy dormant bushes—ones that shed their leaves in winter—can be purchased. There is much more trouble about dieback on rose bushes planted as early as December than on those planted later. Especially is this true of such varieties as Golden Emblem, whose canes are somewhat subject to dieback. (See Brown Canker, p. 20.)

Most nurserymen who sell roses make every attempt possible to keep the bushes in good condition for planting on delivery. Many bushes are coated with wax to prevent excessive drying out. Occasionally, however, conditions arise over which a nurseryman has little or no control. Something may cause the roots to dry out excessively. If this happens, the plant may be very slow to start, or it may not start at all unless given special treatment.

If a rose bush should arrive somewhat dried out, moisture can often be restored. This is done either by soaking the roots in water or, even better, by covering the plant with moist soil for several days—even for a week or longer—until the tissues have taken up the normal amount of moisture.

Usually a rose bush is shipped while dormant, with bare roots snugly wrapped in moist sphagnum moss to prevent drying out. Therefore, only occasionally will a bush be so badly dried out on arrival that it cannot recover in either of these ways. The important thing is to have the bush dormant and the tissues plump at the time of planting. If the tissues are severely dried out, the bark will be shriveled.

Bushes with bare roots must be set out well in advance of the appearance of new growth.

Roses should be planted in full sun or where there is a reasonable amount of sun during the day. When grown in the shade,

Fig. 5.—One of the newer varieties among the long-blooming floribundas to meet with great approval is Red Ripples.

they are more likely to be troubled with mildew than when grown in full sun. Growers in the hot interior valleys will probably find that the flowers bloom faster than those grown in a cool climate. In these areas a location protected from some of the hot afternoon sun might give better results. Avoid windy locations.

In most parts of California, roses are not injured by freezing, although in the high mountains they may require some protection. Unseasonal frosts could, of course, cause damage to new growth.

Roses thrive in almost any well-drained, fertile, loam soil. They cannot be expected to do well in soils which contain an excessive amount of alkali salts or other harmful chemicals.

The soil should be well drained to prevent possible root injury. If it is too heavy, and drainage is poor, put a layer of gravel or peat moss in the bottom of the hole. Do not attempt to plant roses where the soil is poorly drained. Remember, on the other hand, that sandy soils dry out faster than heavier soils.

The hole in which the bush is to be planted should be somewhat larger than the root system. The best soil should be piled at the side to fill in around the roots later. The roots should be spread out in normal position, with the moist soil sifted in about them. Finally, the soil should be firmed snugly with the foot so that the bush stands at approximately the same depth as it did in the nursery (fig. 7).

Planting too deep leads to weak lateral growth. Allow for settling after planting, and also for the addition of mulch.

The depth should be measured after the soil is fully settled by irrigation. The soil should not cover the stem more than 2 inches above the place of bud union. Eastern rose growers often plant bushes very deep to prevent the canes above the bud union from being killed in freezing weather. There is no need for such deep planting in California. In fact, the best new canes will develop close to the bud union if the bush is not planted too deep.

Until the bush is well established, leave a basin around the plant for irrigation (fig. 8). If the soil is heavy, the basin may be permanent, but soils that take water readily will not require basin irrigation.

Most rose fanciers prefer to plant several bushes together in pleasing groups rather than alone. All standard or tree roses should be staked carefully and tied (fig. 9), so that the canes will not break in a strong wind. Climbing roses will ultimately need support, such as a wall, lattice, or fence—whatever local conditions require.

Occasionally a rose bush must be transplanted, or a balled or canned rose may need to be set out after buds have started growth or following very hot weather. If so, be certain that the soil around the

Fig. 6.—There is still some interest in the single rose. One of the best of the climbing singles is Dainty Bess.

roots, or in the can or ball, is moderately damp so that it will not crumble and expose the roots. Prune back and thin out the top to counteract any loss of roots. Then protect the plant from sunburn for a few days with burlap or some other covering. This latter precaution will help to give the bushes a good start.

Keep Soil Moist But Not Wet

Roses need a moderate amount of soil moisture throughout their root zone to make good growth. They cannot grow into a dry soil. Watering too often or too lightly favors a shallow root system.

When irrigation is necessary, the water should be run long enough to wet down to the full extent of the root zone. This will probably be at least 2 feet. Then no water should be added until the roots have had time to use up most of the available moisture. The soil moisture should vary between the point of full capacity and the point where the leaves begin to wilt. If the soil is not wet down to full root depth at irrigation, it might just as well not be wet at all.

A cubic inch of water in sandy soils should wet directly downward about 12 inches; in loams, 6 to 10 inches; in clay soils, 4 to 5 inches. To wet the soil down 2 feet in an area 10×10 feet will require about 125 gallons in sandy soils, 190 gallons in loam soils, and about 330 gallons in clay soils.

How often to irrigate needs to be known. Since sandy soils do not retain any large amount of available water very long, they must be irrigated more often, perhaps once every 4 to 10 days. Loam soils retain more moisture than sandy soils; therefore, they may need to be irrigated once every 8 to 15 days in summer. Clay soils of large water-holding capacity may need to be irrigated only every 15 to 30 days.

Weather is also a guide for irrigation. During hot spells it may be necessary to water weekly or twice a week in sandy soils, especially shallow-rooted plants.

In planning for irrigation, it is necessary to decide whether to run the water in furrows or in basins, or to apply it by overhead sprinklers. Furrow irrigation is often the most economical method if the land is reasonably level. If the ground is very sloping, the furrows should probably run at right angles to the slope. A moderate drop of 4 to 6 inches in 100 feet is suggested for clay or loam soils, and about 10 to 12 inches in 100 feet for sandy soils. It is sometimes best to make the basin around each rose bush permanent, then at irrigation fill it so that the water will wet down to at least 2 feet.

Overhead sprinkling should be done early enough in the day so that the foliage dries off quickly. Otherwise, overhead sprinkling may encourage powdery mildew. In order that the water from the sprinklers may penetrate the soil to a uniform depth, the sprinkler heads should be set to overlap each other by one half the diameter of the circle covered by the sprinkler.

Tillage makes a rose garden look well cared for, but it does not conserve soil moisture. The ground around the rose bushes should be properly mulched, and the bushes adequately watered, but, insofar as the rose plants are concerned, tillage is not necessary except to control weeds. Weeds may also be controlled by sprays. These include light oils which are very effective on most young weeds. Diesel oil, fortified diesel oil, stove oil, and various similar weed killers are being used. Some of these are sold under trade names, such as Standard Weedkiller No. 1 and Shell Weedkiller No. 10.

Give Essential Plant Food

Roses require a great amount of all the essential plant foods—nitrogen, phosphoric acid, and potash. A deficiency in any one will affect the growth of the plant as a whole.

California soils in general tend to become deficient in nitrogen first, although

some may become slightly deficient in phosphorus. Most California soils are quite high in potash, but occasionally a soil will become deficient.

The best roses are grown where soil fertility is maintained at a relatively high level. Fertilizer is applied primarily to overcome deficiencies, such as nitrogen and occasionally phosphorus and potassium deficiency.

On the other hand, some soils contain too much alkali. Occasionally a soil will contain too much lime, which interferes with the availability of iron. This brings about a condition known as lime-induced chlorosis. The presence of chlorotic leaves —or leaves which are yellowing—from soils which are known to have a high lime content, might indicate this trouble. However, the grower must not guess at this cause. Certain virus diseases which attack roses may also affect the green color of the leaves—although where a virus is present, the leaves may be yellowed only in spots. If too much lime is the cause, however, other kinds of plants nearby will also be likely to develop yellowed leaves.

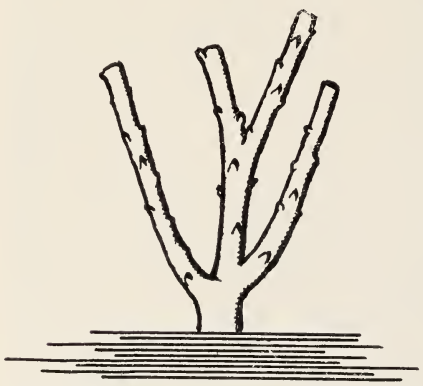

Fig. 7.—At planting, firm the soil about the stem so that the bush stands at about the same depth as it did in the nursery.

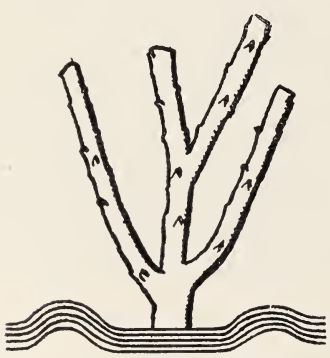

Fig. 8.—Until the bush is well established, leave a basin around the plant for irrigation.

In most California gardens, virgin soils are sufficiently fertile not to require very much fertilizer. Gardeners have found that the addition of 1 to 2 inches of barnyard manure in the late fall or early spring will keep the bushes in good health to produce the highest quality of roses. This organic matter will, in time, react with the soil to help make the fertilizer elements already in the soil available to the plant. At the same time it will supply some plant food, although manure is usually a more expensive source of nitrogen than commercial nitrogen fertilizers.

Some growers, however, may wish to apply a mixed fertilizer instead of manure. To keep roses in good growing condition, a fertilizer containing 6 per cent nitrogen, 10 per cent phosphoric acid, and 4 per cent potash should be sufficient. The potash is actually essential only if the soil is known to be deficient in it. Mixtures with a somewhat higher content of nitrogen may be more economical when purchased in quantity.

Both barnyard manure and commercial fertilizer should be applied with care. Properly aged barnyard manure should be dug into the soil around the bush once or twice during the blooming season. It should be applied at a depth of approximately 2 inches each time it is used. Commercial fertilizer, which is much stronger than barnyard manure, should be applied in a circle, some 8 inches out from the trunk of the plant. It should be carefully mixed into the soil. A full watering should follow application of either type of fertilizer.

Other mineral elements may occasionally be lacking or possibly be present in excessive amounts. For instance, too much chlorine or too much salt in irrigation water will soon cause trouble.

A deficiency of nitrogen will result in a yellowing of the leaves and the development of smaller flowers of light color. A deficiency of phosphorus may cause the older leaves to drop without turning yellow; the stems may be weakened and the bud development slowed by a smaller root system.

A deficiency of iron first shows as a light yellowing in the tips of the leaves. In time the area between the veins may become very yellow, while the veins remain dark green. A deficiency of manganese causes a loss of green color similar to iron deficiency, but even the smallest veins remain green in manganese deficiency, and damage is most pronounced in the top of the rose plant.

Where alkali salts are present in the soil in excessive amounts, the first step is to wash out the soluble sodium or potassium and chlorine by heavy irrigation. The addition of sulfur at the rate of about 1 pound to 40 square feet will help make these alkali salts more soluble. Better drainage is usually required in reclaiming alkali soils. Roses grown on Ragged Robin root seem to be the most resistant to an alkaline condition of the soil.

Occasionally the flower buds on roses fail to lengthen properly and remain stubby. These are sometimes called "bull nose." The exact cause of this has not been fully determined, but it is believed to be related in some way to a nutritional unbalance occurring when the stock used is too vigorous for the rose bush. A similar deformity may develop when the rose bush is overstimulated with a nitrogen fertilizer. This is especially likely to happen early in the year.

When some varieties are budded on stocks of vigorous old bushes of multiflora, they also may develop "bull nose." If tests show that the trouble is nutritional unbalance, either from use of too vigorous a stock for the top or by overstimulation with a nitrogen fertilizer, the fault may be avoided in the future by a better selection of understock and by correcting the method of fertilizing.

How to Propagate Roses

Home Method of Propagation. The home gardener often wants to root cuttings of some of his best roses. This can be done on self-roots if cuttings can be rooted successfully under local conditions. December is a good time to begin. This is well in advance of the time when new growth pushes out, and will give the home gardener a chance to callus and root the cuttings before top growth starts. After new growth shows, it is almost impossible to root a cutting successfully in the home garden.

The cuttings, which should be cut just below a bud, should be callused in sand

Fig. 9.—Stake and tie standard or tree roses to keep the canes from breaking in a strong wind.

for rooting, or they should be inserted to at least two thirds of their length in well-drained soil in the garden (fig. 10). If this is done in December, with the cuttings inserted in moist, well-drained soil, no further attention is needed except proper irrigation and spraying for pest control. Leave at least one or two buds exposed at the top of the cutting (fig. 11). Under favorable conditions the cuttings will callus and root as shown in figure 12. It is best to leave these cuttings undisturbed the first growing season, then set the best rooted ones in the permanent location about January of the following year.

Commercially grown roses are nearly always budded so that budwood, which is scarce, will produce the maximum number of plants. In this way a suitable

Fig. 10.—One method of propagating roses is to insert the cutting to at least two thirds of its length in well-drained garden soil.

Fig. 11.—Leave at least one or two buds exposed at the top of the cutting. The cut should be made diagonally just above the top bud.

rootstock can be selected for easy transplanting. The nurseryman plans to do the work of budding over a period of several weeks and selects his understock accordingly. Ragged Robin and Dr. Huey (Shafter strain) are two very popular rootstocks in California. Buds inserted in August will remain dormant until the beginning of the next growing season.

The home gardener is not concerned so much about scarcity of propagating stock. He may wish to start with cuttings taken from good varieties that root easily. A few roses, however, will not root easily from cuttings, so these will need to be budded. Rooted cuttings of home-grown roses should be transplanted to the permanent location at the end of the first growing season.

Commercial Propagation. The method used by a nurseryman to propagate roses is very different from that used by the home gardener, but the latter may want to know how the nurseryman judges the suitability of a rootstock. Certain points are considered very carefully: 1) resistance to drouth and summer heat; 2) length of life of the plant which is budded on it; 3) tendency to sucker; 4) resistance to root-knot nematodes; 5) season during which it can be budded successfully; 6) continuity of growth and ease of budding; 7) distribution of fibrous roots and condition of roots for transplanting; and 8) resistance to cold. These eight points are followed with little deviation in practically all commercial nurseries.

Fig. 12.—The cutting which is propagated by callusing in sand will go through three stages of development.

The rootstocks used for propagating include Ragged Robin, *Rosa odorata, R. rugosa,* manetti (*R. noisettiana,* formerly *R. manetti* or *R. chinensis* var. *manetti*), *R. multiflora* or its hybrids.

The rootstock which most satisfactorily meets the 8 points required for nursery propagation is Ragged Robin. It resists drouth and summer heat better than most rootstocks. Plants budded on Ragged Robin may live longer than those on *R. multiflora* or manetti. Suckers rarely appear when the eyes of the cuttings have been properly removed. The rootstock is more resistant to nematodes than *R. multiflora,* manetti, or *R. odorata.* The stock remains in good condition for budding over a longer season than does *R. multiflora* or manetti. And its steady growth makes budding possible at almost any height. From the nurseryman's standpoint, Ragged Robin is a fine stock, with a good distribution of straight feeder roots. Roses propagated on this rootstock usually are reasonably resistant to cold, certainly more so than roses propagated on *R. odorata.*

The variety now often used as an understock in rose nurseries is Dr. Huey. The strain has proved to be very fine as a rootstock. Some rose growers use about 60 to 70 per cent of this rootstock and the rest of Ragged Robin. This is done mainly to increase the period for budding. Dr. Huey grows so rapidly that it cannot be budded much later than August 1. On the other hand, Ragged Robin can be used for later budding, although it does not seem to give such a strong root system as Dr. Huey.

IXL, a seedling of Veilchenblau is often used to form the trunk of standard or tree roses. Since this particular variety does not have a good fibrous root system, it is not very satisfactory as a rootstock.

The actual method of propagating most often used in the nursery is to callus the cuttings, then line them out in rows to root for budding to the desired variety later in the year. Budding is done because the budwood of new varieties goes much farther than cuttings. Budding also avoids the difficulty of transplanting some rootstocks.

When roses are budded in June on vigorous new growth, it is possible to force out buds the same season. But when budding is done late in the year, bud growth does not have time to get very long before the dormant season sets in. Many nurserymen prefer to insert the buds in August or even in early September. By budding earlier, the buds will unite and remain dormant until the beginning of the next growing season. Since the so-called dormant buds have a full season in which to grow, they are generally preferred to the June buds. One to two years from the time they are budded, rose plants are usually old enough to sell. They are classified according to three grades.

How to Grade Roses for Sale

When roses are sold according to grade, they are listed under No. 1 (Large), No. 1½ (Medium), and No. 2 (Small). The amount of growth found in these grades will vary somewhat with the vigor of the variety. The more vigorous varieties will usually have three canes or, as in No. 1 grade, two 18-inch canes. In No. 1½ grade there should be two canes 14 inches long, and in No. 2 grade, one strong cane or two canes 10 inches long. The weaker varieties should have three canes in No. 1 grade or two canes about 15 inches long. Plants in No. 1½ grade should have two canes about 12 inches long, and those in No. 2 grade, one strong cane or two 10-inch canes.

The hybrid perpetual roses and other very vigorous roses will probably make a better length growth than the varieties just mentioned. Growers therefore can expect three canes of 20-inch length in No. 1 grade, or two canes of 12-inch length in No. 1½ grade. No. 2 grade should have one strong cane or two 10-inch canes.

Fig. 13.—The rose aphid, *Macrosiphum rosae*, is a large green or pink species infesting the growing tips and buds of a plant. It may congregate in large numbers.

Occasionally, there are weak varieties within the hybrid perpetual and similar classes. When this is true, the canes may be only 16 inches long in No. 1 grade; 12 inches in No. 1½ grade; and 10 inches in No. 2 grade.

Polyantha roses are expected to have four canes 10 inches long in No. 1 grade; three canes of 8 inches in No. 1½ grade; and two canes of 6 inches in No. 2 grade.

Most climbing roses are known for their vigor and length of growth. In No. 1 grade, most of the climbers should have three canes 24 inches long; in No. 1½ grade, two canes 18 inches long; and in No. 2 grade, one strong cane or two 12-inch canes.

Certain other varieties of vigorous roses may produce extra canes; it is therefore reasonable to expect such varieties as Dorothy Perkins and Hiawatha to have four canes 24 inches long in No. 1 grade.

Bare-root plants are sold in the nurseries from December until new growth pushes out. After new growth appears, the nurseryman usually pots the unsold rose plants, often trimming back the roots to fit the plant into the container. An extra charge is made for this additional work. For planting in January and February, No. 1 bare-root plant has no superior. Later in the year, you will probably have to buy roses planted in containers, even though such plants are rarely equal to No. 1 bare-root plants sold in January or early February.

Small rose plants are sold in cartons at certain stores. Such plants should prove satisfactory for their grade unless they are held too long. No. 1 grade is usually superior to No. 1½ or No. 2 grade when sold at the normal season. Gardeners should see that the plants are in good condition at the time of purchase.

Identify Insects for Control

There are effective methods of control for practically all the many insects attacking roses.

Aphids or Plant Lice. Two kinds of aphids are common pests on roses. One is the rose aphid, *Macrosiphum rosae* (fig. 13), which is a large green or pink species infesting the growing tips and the buds. The other is the small green rose aphid, *Myzaphis rosarum*. This insect works on all parts of the plant, particularly on the underside of the leaves. There it produces quantities of honeydew on which grows a black, sooty, mold fungus.

Aphids are fairly easily killed with a No. 5 nicotine dust (about 2 per cent nicotine) or a No. 10 nicotine sulfate dust (contains about 4 per cent nicotine) applied generously on warm days—approximately 70° F. Or they may be controlled

with an application of 40 per cent nicotine sulfate, such as Black Leaf 40, used at the rate of 1 part to 800 parts of water—or about 1 level teaspoon per gallon of water. The addition of about 2 tablespoons of powdered soap increases its efficiency. This spray should be applied directly to the insects in a fine mist from any good hand sprayer.

Early in the season, before the roses are in bloom, these aphids may be washed off with the hose every 2 or 3 days. This is best done early enough in the day for the foliage to dry off quickly. In this way, any danger of powdery mildew will be lessened. Pyrethrum oil sprays intended for plant use, applied as a mist spray to cover the insects, are effective against aphids. Pyrethrum dusts containing 0.1 to 0.2 per cent pyrethrins are also effective against aphids. Rotenone sprays are also used.

Borers. Certain borers, such as the flatheaded apple tree borer, may infest badly sunburned rose bushes. The bush may start to die back in spite of good soil and watering. Borers may be found within the injured parts. These pests are not serious if the bushes are properly cared for after planting. The raspberry horntail is also a borer that causes infested green tips to wilt. (See Raspberry Horntail.)

Red Spider Mite or Two-Spotted Spider Mite. The two-spotted mite, *Tetranychus bimaculatus* Harvey may cause a considerable amount of damage to the foliage of roses under greenhouse conditions, and to those in the open garden during the summer months. Spider mites can be seen only with the aid of a magnifying glass. A yellowing of the leaves in spots may suggest spider mite injury.

Frequent hosing off of the leaves will control most of these red spider mites. Dusting with sulfur alone is also effective, but the sulfur will leave an objectionable residue. Danger from sulfur burn can be avoided somewhat by applying the sulfur 2 or 3 weeks before an oil spray is applied, and by avoiding weather conditions which increase leaf injury where sulfur is present. Eliminate as far as possible other host plants harboring these mites.

Raspberry Horntail. This insect, *Hartigia cressoni* (fig. 14) attacks the growing tips on climbing roses in some of the warm interior valleys, but it is rarely serious. The wilted tips containing the larvae of the raspberry horntail should be cut off and burned to prevent further injury. All badly infested host plants should be dug up and entirely destroyed before new growth starts in the spring. No spray is effective in control.

Fig. 14.—The raspberry horntail in larva and in adult female and male forms. ***(About three times natural size.) (From Extension Circular 87.)***

Rose Scale. The rose scale, *Aulacaspis rosae,* often thickly infests the older canes. Its presence is indicated by white, flattened, armored scale insects on the older rose canes. It can usually be controlled effectively by cutting out all of the older canes without leaving any stub, and by properly pruning any bush berries near by that may also be infested with the scale. A winter-strength oil spray may be safely applied where necessary.

Rose Slug. The bristly rose slug, *Cladius isomerus,* infests roses more frequently in the San Francisco Bay area than in any other section of California. It appears as a yellowish-green, bristly wormlike insect which eats holes from the underside of the leaves (fig. 15) from about May on, as long as green leaves appear. The adult, which resembles a small wasp, lays it eggs on the underside of the petioles, and the insects may continue to appear from May on through the summer until early fall.

Where the rose slug is troublesome, the rose leaves should be sprayed two or three times during the season, starting about the first of May. Lead arsenate, used at the rate of ½ ounce, or 3 level tablespoons, to the gallon of water, is effective, but leaves a gray residue on the foliage. This residue is less objectionable if the first application is delayed until most of the first crop of roses has been harvested.

Liquid rotenone sprays have also been used to control the rose slug. These do not leave an objectionable residue. They are applied at about the same concentration as 40 per cent nicotine sulfate, or a teaspoon to a gallon of water. However, directions on the package should be followed. Spray first about May, or about the time the rose slugs begin to eat the leaves.

Various trade products are also available for the control of this and of similar chewing insects. A second application will usually be needed in early July to protect the leaves which have come out since spring.

Fig. 15.—The bristly rose slug is a yellowish-green, bristly, wormlike insect which eats holes from the underside of the rose leaf.

Rose Snout Beetle or Rose Curculio. The small red and black rose beetle, *Rhynchites bicolor* (fig. 16), about ¼ inch long, may begin to puncture holes in the stems or buds starting to develop in the early part of summer. The sprays used to control the rose slug will help control the snout beetle. A 5 per cent nicotine dust has also been helpful. An application of lead arsenate will protect the leaves covered, but nicotine sulfate has to be applied directly on the insects. Hand-picking or jarring the beetles into a pan of oil may be adequate where only a few are present.

Fuller Rose Beetle or Weevil. The Fuller rose beetle, *Pantomorus godmani,* is a gray, wingless beetle, about ⅜ inch long. It eats around the leaf edges of roses and certain other plants. It may be effectively controlled with the same stomach poisons used for the rose slug, or the entire rose plant may be dusted with cryolite dust.

The rose beetle can be prevented from crawling up the canes of the rose bush by tying cotton snugly around the stem as a barrier. This is practical, however, only where a very few rose canes are growing, as on some climbing roses. The rose beetle is not abundant in most gardens.

Thrips. The flower or grass thrips, *Frankliniella moultoni,* sometimes appears on unfolding rose buds. It may increase blasting, a condition discussed under diseases. The rotenone sprays sometimes used to control rose slugs are also effective against flower thrips. The pyrethrum-oil sprays are as highly effective against this pest as against aphids. Some of the trade products on the market containing both pyrethrum and rotenone should prove satisfactory. Wettable DDT dust may be applied occasionally, allowing 1 pound actual DDT to 100 gallons of water (about 3 level tablespoons to 3 gallons of water). An application once every 10 days or 2 weeks during the early growing season should be adequate. The underside of the leaves should be completely wetted at each application.

Fig. 16.—The small red and black rose snout beetle, or rose curculio, may puncture holes in the stems or buds which start to develop in early summer. (From Essig, *Insects of Western North America. Courtesy The Macmillan Co.*)

Other Insects. Certain other insects, such as the leafhopper, may occasionally cause damage, but they are of minor importance. The rose leafhopper, *Typhocuba rosae,* is reported to have caused some damage in the San Joaquin Valley. In the San Francisco Bay area, the blue sharpshooter, *Cicadella circellata,* is often found on rose leaves, but does not seem to cause much damage. A 5 per cent nicotine dust is effective on the young nymphs. DDT sprays are also useful in control. A 50 per cent wettable DDT powder used at the rate of 1 ounce, or 3 tablespoons of powder, to about 3 gallons of water may be sprayed on the foliage, beginning in May and repeated about once a month for 2 or 3 months. Shake this mixture well from time to time to keep the DDT powder in suspension. (See "Use Combined Spray Program," p. 23.)

Recognize and Control Diseases

A number of diseases attack roses, yet only a few are really serious enough in California to need careful treatment. However, the various diseases will be described in the hope that the grower will understand the nature of the trouble, and will take whatever control measures are necessary.

Anthracnose. This is caused by the fungus *Sphaceloma rosarum.* It appears on the leaves as small, circular, light-colored spots bordered with black. Diseased leaves drop prematurely. This and other fungus troubles may be controlled by the usual copper or sulfur sprays.

Black Spot. This disease, which is fairly common, but rarely serious, in the moist coastal area of California, is caused by the fungus *Diplocarpon rosae* (fig. 17). Irregular, dark-brown or black spots

Fig. 17.—Black spot shows in irregular, dark-brown or black spots which increase in size until most of the leaf surface is affected. It usually causes premature leaf drop.

with a fibrillose margin appear on the upper side of the leaves. These spots increase in size until most of the leaf surface is affected. The remaining part of the leaf usually turns yellow, and the leaf then falls. This disease can also be controlled with Fermate.

Bud Blast or Blight. This disease is especially common on rose plants which have not been given the best attention. Certain varieties may also be unusually susceptible. The outer petals turn brown and die, and thus prevent the flowers from expanding. A gray mold, *Botrytis cinerea,* may attack the flower tissues; the unopened flower will then drop off. Rose mildew and flower thrips may cause this trouble to increase.

Canker, Cane Blight, and Dieback. There are three kinds of canker: plant canker, which is caused by *Coniothyrium Wernsdorffiae;* stem canker, by *C. Fuckelii;* and brown canker, by *Diaporthe umbrina.* Dead areas appear on the canes, especially around wounds made in pruning or where flowers have been cut. While this trouble is not very common in most parts of California, occasionally it may result in considerable damage on such varieties as Golden Emblem. If pruning is delayed until new growth pushes out, and if wounds are covered with a suitable wound dressing, such cankers can be controlled fairly well.

Chlorosis. California soils occasionally contain an excessive amount of lime—ranging as high as 5 to 20 per cent. When lime reacts with the iron in the soil, it makes the iron more or less unavailable for plant use. As a result, the tissues between the veins of the leaves lose much of their green color, and growth may be somewhat slowed.

Iron sulfate may be applied to the soil at the rate of 1 to 4 ounces for each square foot—depending on how much lime is present—to help insure an adequate amount of available iron. Iron sprays are also available. When manganese sulfate is sprayed on the foliage, it may help to improve the green color.

Crown Gall. This disease, caused by *Agrobacterium tumefaciens,* is characterized by the appearance of rough galls or swellings on the roots or on the crown of the rose bush. It usually appears where the tissues have been injured in cultivating. This same bacterial disease attacks bush berries, almonds, peaches, and other related plants; it may spread rapidly under favorable conditions.

A product known as Elgetol has been used successfully to destroy the galls on peaches and almonds. This product is painted on the galls. It is hoped that such treatment will be effective when applied to the young galls on roses. (ELGETOL IS POISONOUS TO HUMANS AND ANIMALS AND MUST BE USED WITH GREAT CAUTION.) The rose bushes should be examined carefully at the time of planting. Any galls present should be removed, and all cut surfaces and pruning tools should be disinfected with corrosive sub-

limate, diluted at the rate of 1 part to 1,000 parts of water. (CORROSIVE SUBLIMATE IS VERY POISONOUS TO HUMANS AND ANIMALS, AND SHOULD BE HANDLED WITH GREAT CAUTION.)

Mildew. Two kinds of mildew may attack roses—powdery mildew and downy mildew.

Powdery mildew is caused by the fungus *Sphaerotheca pannosa*. This form is the one of greatest interest to rose fanciers. Powdery mildew is found in practically every part of California. This is especially true near the coast where moist, foggy conditions prevail. It attacks the young leaves, buds, and shoots of susceptible varieties, usually distorting their growth. Powdery mildew requires repeated spraying with a copper or sulfur fungicide throughout the early growing season.

The copper and sulfur sprays will usually control both kinds of mildew. Summer strength liquid lime-sulfur, ammoniacal copper carbonate, and similar mildew sprays are effective. A scant pint of lime-sulfur to the gallon of water makes a good winter spray. After the leaves appear, reduce the amount to about 1½ tablespoons of lime-sulfur solution to a gallon of water (see "Use Combined Spray Programs," p. 23).

Among the more promising mildew sprays may be included a product known as Triogen. Many experienced rose growers report excellent control with this mixture. It comes in three cans labeled "1," "2," and "3." These cans are added to the water in the spray tank in the order of the numbers without straining. After shaking or stirring, the spray is ready to apply. It does not leave an unsightly residue on the foliage, nor does it stain painted walls so much as the sulfur Fermate mixture. In order to avoid possible damage to the foliage, the amounts used must be accurately measured according to directions that come with the materials. Apply the spray about once every week or 10 days as long as mildew threatens. Such sprays are applied to prevent, not to cure, rose mildew.

One of the wettable colloidal sulfur sprays which has given good control is Nangatuck Sulfur.

Downy mildew is caused by the fungus *Peronospora sparsa*. It appears as irregular brown spots on the underside of the young leaves; badly blighted leaves will fall. Downy mildew has been reported only where conditions are very humid, as in some greenhouses.

Resistance to Mildew and Other Diseases. Much progress has been made in recent years in breeding roses for resistance to mildew and other diseases. Many of the newer roses are highly resistant to mildew, sometimes practically free from it. This is particularly true where the foliage remains reasonably dry during early development of the disease.

A few popular varieties known to be disease resistant are: Captain Thomas, Charlotte Armstrong, Debonair, Duchess of Athol, Etoile de Hollande, Fantasia, Golden Rapture, High Noon, Katherine T. Marshall, Mme. Henri Guillot, and Ville de Paris. The bush form of Cecile Brunner is one of the popular polyantha roses known to be resistant to mildew.

Such climbers as Mermaid are comparatively free from disease. Usually the climbing forms of resistant bush roses are also disease resistant, although sometimes they are somewhat more susceptible because of the tender, vigorous growth. For instance, the succulent tips of the climbing Cecile Brunner may be attacked by mildew in a cool, moist climate.

Exposure, climate, and variety all affect freedom from disease. Where a variety is known to be susceptible, try to plant it where the foliage will remain as dry as possible, and spray regularly for mildew control. Encourage a moderate growth rather than a rank, succulent growth on such susceptible varieties. In the cool coastal districts where mildew is most severe, it may be best to avoid susceptible varieties.

Mosaic. Trouble from this virus appears in several forms (fig. 18), often causing a blotchy yellow appearance on the leaflets. Since the disease may be carried from the rootstocks to the budded part of the plant, start only with healthy rootstocks—which most nurserymen try to use. There is no cure for rose mosaic, so any plant found to be affected with this virus disease should promptly be discarded to avoid possible spread to healthy plants.

Oak Fungus. This disease is caused by the fungus *Armillaria mellea,* and may be present in certain California soils. Oak fungus usually attacks the tissues below the surface of the ground, where it causes dead areas to appear in the bark. Ultimately, a white, fan-shaped fungus forms between the dead bark and the wood. It is impractical to try to cut out the diseased portions of the rose bush. Furthermore, there is a strong probability that the oak fungus in the soil will attack new rose bushes which are used to replace the diseased plants.

Fig. 18.—Mosaic may be carried from the rootstock to the budded part of the plant. Starting with healthy rootstocks will help to prevent this disease.

Where oak fungus prevails in the soil, the gardener should consider planting certain resistant ornamentals. A list of ornamentals known to be resistant may be secured from the Public Service Office, Agricultural Extension Service, University of California, Berkeley 4.

Rose Rust. In many instances, the first stage of rust is indicated by a mottled condition of the upper leaf (fig. 19). In its advanced stage, it produces bright orange pustules on the underside of the leaves. Islands of green tissue remain in the areas where the spores form. The rest of the leaf becomes yellowed or chlorotic.

Rust is caused by the fungus *Phragmidium mucronatum.* Some varieties of roses are more susceptible to the disease than others. Planting a susceptible variety near one badly attacked by rust will surely lead to spread of the disease. Complete defoliation at the time of winter pruning is necessary to prevent a carryover of both rust and mildew from one crop of leaves to the next. Many rose fanciers have had trouble when they were careless about these details.

The measures used to control mildew, including lime-sulfur solution, will also help prevent rose rust, but most fungicides will not completely control this disease.

A promising control for rose rust reported by rose fanciers consists of a combination of equal parts of wettable sulfur and Fermate. After mixing the two in equal parts, place 3 level tablespoons of the dry mixture in a quart jar and add enough water to produce a creamy mixture; then strain it through a fine tea strainer into the spray tank. Add ½ teaspoon of a good spreader or sticker, and, finally, enough water to make 1 gallon of spray. Usually 40 per cent nicotine sulfate, such as Black Leaf 40, is added at the rate of 1 teaspoon to a gallon.

Where chewing insects, such as the rose slug, are also causing trouble, they may be controlled by adding about 1 teaspoon of wettable DDT powder to each gallon

of spray about once every 6 weeks. The DDT should not be included in each spray application because it may favor an increase in aphids.

It is true that the measures used to control mildew, including lime-sulfur solution, will also help to prevent rose rust, but most fungicides are not a complete control. On the other hand, the Fermate treatment, which is so effective for control of rose rust, is not adequate for the control of rose mildew.

Use Combined Spray Program

A combined spray program should be followed for the control of the more common pests and diseases on roses. Many gardeners with only a few rose plants will prefer to buy trade products to apply as a combined spray. Most of these sprays are effective because they contain copper or sulfur. They may include a pyrethrum-rotenone-oil combination for insects, to be used along with a copper spray of some kind for the control of mildew. DDT may be present along with sulfur in some combined sprays. Sulfur and oil cannot be safely used together, but pyrethrum oil sprays are quite satisfactory. Triogen and similar trade products are intended to control more than one trouble.

Soap should not be used with pyrethrum, lead arsenate, cryolite, various copper sprays, or with lime-sulfur. Lime-sulfur should not be used with standard lead arsenate, soaps, or bordeaux mixture.

Fig. 19.—Rust often attacks the least vigorous varieties of roses. It shows a mottled condition of the upper leaf in the first stage; bright orange pustules on the underside of the leaf in the advanced stage.

With trade products, follow recommendations given by the manufacturer for safe mixture or combinations.

Where only one trouble appears at a time, use any one of the effective control measures, such as 40 per cent nicotine sulfate for the control of rose aphids, or any good mildew spray for the control of rose mildew. But in most gardens it will be desirable to combine an insecticide with a fungicide for the control of both rose mildew and aphids in the early part of the growing season. Should the rose slug appear along in May, include in the combined spray a stomach poison as well as a contact insecticide. The combined spray program should usually start about May 1, continuing every 1 to 2 weeks, or as long as new growth appears.

One simple combined spray formula for summer use consists of:

1½ tablespoons of lime-sulfur solution
1 tablespoon of Dreft
2 scant teaspoons of Black Leaf 40
1 gallon of water

Reduce the amount of lime-sulfur if the foliage shows any indication of injury.

How to Use Spray and Dusts

The selection of the spray material will depend upon the type of sprayer used. A sprayer with a bordeaux nozzle will accommodate regular winter strength bordeaux mixture, lead arsenate, and various other spray materials which would clog the atomizer type of sprayer. Since most rose fanciers prefer spray materials which do not leave a noticeable residue, selection must therefore be made from a limited number of fungicides in the combined spray.

After growth starts, apply summer strength lime-sulfur at the rate of 1 gallon to 100 gallons of water. Add to this 5 pounds of wettable sulfur and 1 pint of 40 per cent nicotine sulfate solution, such as Black Leaf 40. This is at the rate of 1½ ounces of wettable sulfur, and 1 teaspoon of nicotine sulfate for each gallon of water. A small amount of a summer oil spray may be added as a spreader or sticker. In terms of volume, allow about 1½ tablespoons of lime-sulfur solution per gallon of water after the rose leaves are out.

Many trade products on the market contain copper in some form. These may be used with fairly good control of most kinds of fungus diseases, if applied at intervals of 10 days or 2 weeks. Nicotine sulfate or rotenone may be added to control rose slugs. Dusting with sulfur is objectionable, because it leaves a noticeable residue. The same objection holds in the use of powdered lead arsenate. On the other hand, rotenone will serve both as a contact spray and as a stomach poison for the control of aphids or rose slugs.

Under greenhouse conditions, sulfur may be vaporized if placed on the steam pipes or over a low, steady heat on an oil stove, but it should never be allowed to burn. (See "Use Combined Spray Program," page 23.)

Prune to Strengthen Plant

Roses are pruned to improve the quality of the blooms, to regulate the size and shape of the plant, and to remove diseased or damaged parts. If it is properly done, pruning strengthens the plant. If improperly done, it can be highly destructive.

The method of pruning will naturally differ with habit of growth. Since roses are usually classified according to habit of growth, it is easy for the grower to determine what type of pruning to use.

Climbing roses require different pruning from that given to either bush or standard roses. Some climbing roses bloom only once a year—in the spring—whereas others bloom over a long period of time.

Roses may be vigorous or weak in habit of growth. The vigorous growth of many of the most popular new roses is appreciated by all gardeners.

Varieties with tall or upright growth include Autumn, Condesa de Sastago, Duquesa de Penaranda, Golden Rapture, Horace McFarland, Katherine T. Marshall, Odine, Poinsettia, President Herbert Hoover, Rubaiyat, Sonata, Talisman, Victoria Harrington, and White Wings. These varieties may need to be pruned to outside buds to make the plants more spreading. Other varieties, such as Crimson Glory, Debonair, Lucia Zuloaga, and Mrs. Sam McGredy are spreading in growth (fig. 20), and may need to be pruned to inside buds to make the plants more upright. Since most varieties are only moderately upright, special pruning will probably not be required to improve the shape of the plant.

Most people who grow standard roses want a somewhat drooping habit of growth, which gives a rounded head and a satisfactory length of flower stem. They select their varieties with this ideal in mind. Occasionally, however, the standard rose may involve one of the upright varieties, such as President Hoover, which is very hard to manage in pruning.

All such differences must be taken into account when deciding on the best method of pruning. A special detailed leaflet on the pruning of roses is available at the Public Service Office, Agricultural Extension Service, University of California, Berkeley 4. The following suggestions, however, briefly cover the essential points in pruning.

Pruning should be done at least once a year on all roses. The present practice with most varieties is to prune very late in the dormant season. In many instances, pruning is done late in January rather than in December. This allows a minimum amount of time between pruning and the pushing out of new growth. More dieback has been experienced on some varieties of roses when pruning is done early than when done late. By pruning in late January the pruning cuts should heal promptly so that there is less danger of infection. Further protection against any trouble on susceptible varieties is given by covering the larger wounds with a good wound dressing. The cold asphalt materials on the market will do.

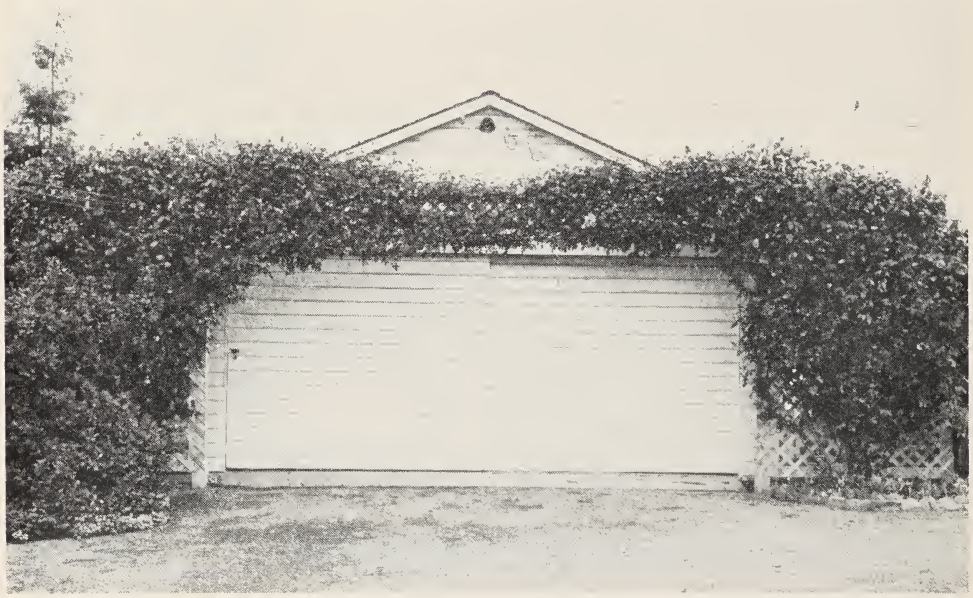

Fig. 20.—Two climbing Mrs. Sam McGredy roses were pruned and trained to cover this garage. The spreading tendency of this variety made training easy.

For climbing roses which bloom only in the spring, delay pruning until after flowering. A maximum number of flowers is thus secured. On the other hand, climbing hybrid teas which bloom over a long season, may be pruned more than once during the year to encourage good blooming.

When deciding on what parts of a rose bush to cut out, remember that the canes on most bushes can be expected to produce good flowers for perhaps four or five years and occasionally longer. When a cane has reached the limit of good flower production, it should be cut back clear to the ground. In the meantime, a new cane should be developed to replace each old cane as it is taken out. If the rose bush has been properly handled, it will develop new canes for this purpose.

When a rose cane is cut back to a bud or occasionally to a lateral, the uppermost bud or lateral will normally make the greatest length growth. You can make an upright rose bush more spreading by cutting back to outside buds or lateral branches. Or you can make a spreading rose bush more upright by cutting back to inside buds or laterals. In this way, it is possible to regulate the shape of the rose bush.

Pruning wounds normally do not need to be covered. However, where a particular variety of rose tends to show dieback after pruning, the wounds probably should be covered with some good wound dressing.

There has always been disagreement about how much to cut back on a bush rose. A plant from the nursery is pruned in still a different way from a plant already established. Some rose fanciers prune to a height of 2 feet; others not more than 15 to 18 inches. Regardless of how much pruning is done, the rose bush should be capable of producing long, healthy new canes.

The amount of pruning should therefore be regulated to give these results. Sometimes a little heavier pruning will encourage longer new growth, whereas an unpruned rose bush will, in time, produce rather short growth. A reasonable amount of thinning-out of new growth will be in order to permit light and air to reach the buds that are left. But remember that pruning should be modified in accordance with habit of growth of the particular variety under local conditions, and with the results desired. A floribunda variety is grown for its masses of bloom while most hybrid teas are grown for quality buds or blooms borne on long stems. Less pruning will encourage more blooms but the size of the flowers and length of stem may be poorer.

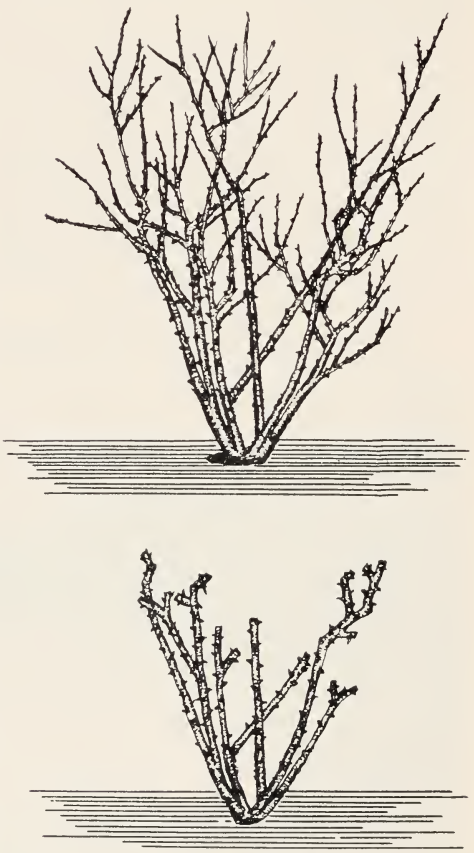

Fig. 21.—A hybrid tea bush rose should be pruned to produce long, healthy new canes. Heavier pruning will sometimes encourage longer new growth, whereas an unpruned bush tends to produce rather short growth.

Ground canes which appear above the bud union are the best wood on a rose bush, and such vigorous new wood should be used to replace the older canes. Remove as much of the older wood as possible and still retain a good shape for the plant. In general, cut the new wood back about half way and to an outside bud or eye. Cut the very soft wood with a sharp knife to avoid ragged edges.

The pruning shears used should always be sharp. One of the popular types is made from the Rieser pattern. The cut should be made within about ¼ inch of the bud—and not farther out.

Roses that have been properly propagated should not produce suckers below the bud union but if, for any reason, suckers do appear, they must be promptly and completely removed. New canes normally develop above the bud union, and vigorous new canes usually push out immediately above the bud union. These vigorous new canes are the ones which should be used to form the framework of the bush and to replace any old canes which must be removed.

Many of the polyantha roses, such as Cecile Brunner, are upright in habit of growth. They usually support more canes than most of the hybrid tea roses, and their canes are not generally shortened-in so much as those on most hybrid teas. Vigorous canes on these upright varieties may develop a cluster of roses. When this happens, the cane should be cut back to a sound bud just below the place where the cane has formed the cluster of roses. Cecile Brunner should be cut to outside buds to prevent too compact growth.

Hybrid tea bush roses will usually respond best to rather severe pruning, although there may be a few exceptions. For example, a vigorous variety, such as Autumn, will probably produce excellent flowering wood when the canes are allowed to reach considerable height. A vigorous rose of this type may be allowed to produce longer canes as well as more canes. On the other hand, certain tea roses, such as Lady Hillingdon, are weak in habit of growth. They cannot be expected to produce the best flowering wood unless they are pruned back rather severely. Such differences in natural vigor, as well as in local growing conditions, should be considered when deciding how much to cut back, both at planting time and in later years.

The climbing hybrid tea roses which have developed as sports from bush roses will usually flower over a long period of time. Such roses may be pruned moderately in the late dormant season. The side

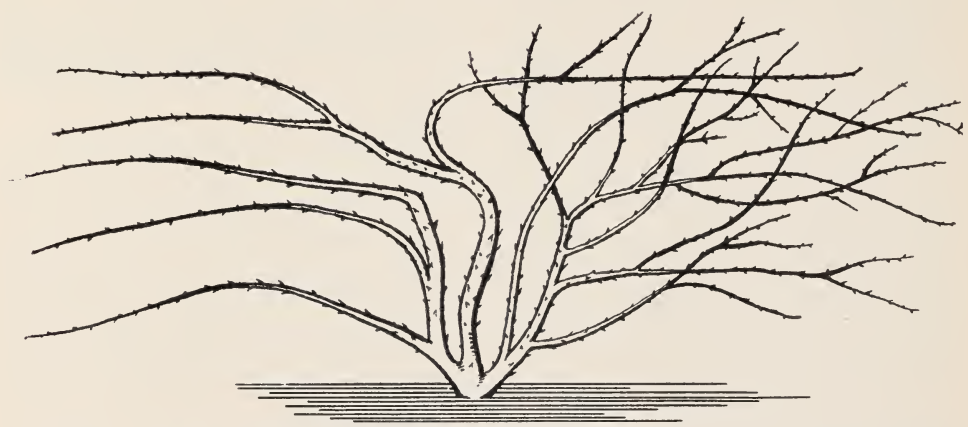

Fig. 22.—Cut back the side branches or laterals on the long canes of climbing hybrid teas which have developed as sports from bush roses. Leave the length growth on the main canes.

branches or laterals on the long canes should be cut back to stubs of from 1 to 3 buds. Most of the length growth of the main canes, however, should be left (fig. 22). Any new canes needed to replace aging ones should not be removed.

Floribunda roses are variable in habit of growth, since they include both the large-flowering polyanthas and the low, compact-growing hybrid teas. This class of roses should be pruned to encourage a mass color effect—for which the floribunda is valued. Just enough thinning-out and cutting-back is required to encourage the production of healthy flowering wood each season. When planted along driveways and walks, where there is plenty of room, the floribundas can form fairly large bushes needing only a small amount of pruning in winter. They may also be pruned a second time during the growing season to keep the long canes in bound.

A climbing variety, such as Belle of Portugal, may also need a second pruning. However, these roses should not be pruned in the late dormant season before the plants have flowered. Among a few other climbing roses which will tolerate more than one pruning a year are Cecile Brunner and Mermaid. In fact, they will tolerate almost any kind of pruning, whether a rather heavy shortening-in of the length growth or a shortening-in of the side branches.

Standard or tree roses are usually pruned to give a fountain effect. An upright variety, such as the President Hoover, should not be selected for this purpose, however, because pruning must be too severe to maintain the characteristic drooping effect. Some rose varieties, such as Debonair, Duchess of Athol, and The Chief, which are spreading in growth, make very good standard rose trees because of their curving stems.

Whatever pruning is required for standard roses should normally be given late in the dormant season. Pruning should be done each year, with only 1 to 3 buds of the past season's growth left.

The question sometimes arises as to how much pruning should be done after each crop of blooms is over. When the flowers fade, they will need to be picked off. It is also a good practice to shorten-in the new growth, cutting back to strong side buds or laterals. The uppermost buds will form new shoots which, in hybrid tea roses and in certain other ever-blooming roses, will flower in time. When the second crop of flowers has finished the blooming period, the growth may again be shortened-in.

By this system, three crops of flowers can be produced under favorable conditions. When the regular dormant season arrives, the different flushes of growth made during the year are usually ignored. The total annual growth is rather severely cut back to a good side bud low down on the current season's growth, with only 1 to 3 buds left on the growth made for the year. Occasionally more buds may be left on very vigorous roses or on such roses as Golden Emblem, which seems to flower better when the canes are allowed to grow a little longer than usual—in fact, Golden Emblem is a rose which should be pruned very little.

Summer pruning involves the cutting-back of vigorous new growth in general. Such pruning tends to be weakening. It should therefore be largely limited to extremely vigorous varieties, such as the Belle of Portugal, and to vigorous hybrid tea varieties which need length growth limited.

The pillar roses also need some pruning in the summer months for good shape when they are in flower. The totem-pole rose or roses which have the canes woven about some form will need to be trained during the summer months, and perhaps shortened-in occasionally to give the desired shape. Summer pruning should therefore be limited largely to maintaining shape.

Pruning at planting time is discussed elsewhere, but is very important in forming a good rose bush.

Replace Declining Plants

A good rose bush, properly cared for after planting, can be expected to produce satisfactory flowers for perhaps fifteen years or longer. In time, however, the bush may decline, for one reason or another, and when that happens, replacement is necessary. Replanting should not be done until the cause of decline is known, since oak fungus, excessive alkali, and other troubles may require some kind of soil treatment to make replanting safe.

Another reason for replacement should be mentioned. Better rose varieties are constantly being introduced, or roses with a different appeal, so that, as the older roses begin to decline, the grower may wish to replant with one of the newer varieties. In this way, the rose garden holds the interest of the public. On the market are many roses which are considered superior to most of the roses grown fifteen to twenty years ago. Some of these roses, for instance, are more resistant to powdery mildew than the older roses.

For such reasons, a grower occasionally wishes to replace a rose bush—even one in fair condition—simply because the newer roses give more enjoyment and involve less work. Many of the newer varieties require less spraying for mildew.

How to Grow and Appraise Exhibition Roses

The appraisal and selection of rose varieties have interested rose fanciers for many years. Various organizations have been formed to help growers. The American Rose Society, with headquarters at Harrisburg, Pennsylvania, has been most helpful to members in the different parts of the country. Organizations in California, such as the Pacific Rose Society, with headquarters at La Cañada, and some local organizations, are affiliated with the national organization, although members of the local organizations may elect to join the national organization.

Another helpful organization already referred to in connection with the All America Awards is the All America Rose Selections. This organization does a fine job in appraising the value of new rose introductions.

It should be remembered that any national appraisal must be correlated with local experience to mean much. Therefore, the mere fact that a rose has been given an All America award does not necessarily indicate its value for a particular district in California, although rose varieties that are generally successful—especially on the Pacific Coast—stand a good chance of being successful in many California gardens.

There are exceptions, however. For example, Mirandy won an All America award in 1945, yet recognized rose fanciers in central California pronounce it almost worthless locally. It needs heat to do well. So, appraisals of a general nature must be adapted to local conditions and experience, and not based solely on some general appraisal, such as the All America Awards choice, or even the high rating in a rose publication. Form or shape, color, substance, stem and foliage, and size are all considered in the judging of roses for exhibition. The allowances for these points are:

	Per cent
Form or shape	25
Color	25
Substance	20
Stem and foliage	20
Size	10

Note that no allowance is given for fragrance in exhibition roses. This is true despite the fact that many people who grow roses unconsciously prefer the varieties with fragrance to those without, even though the roses otherwise are equal in value.

If roses are to be exhibited, the stems must always be disbudded. The foliage should be free from mildew, rust, or other diseases, and should also be free from

insects. A variety with healthy shiny foliage is always appreciated. The stem below the blooms should be properly covered with leaves. Certain roses, such as the President Herbert Hoover, cannot fulfill this requirement; their stems below the buds are not properly covered with leaves. Varieties which make healthy plants with a minimum of care can usually be rated higher for standard purposes than varieties which must be continually sprayed to control diseases or insect pests.

The number of petals is partly a varietal factor and may be affected by climate. Certainly, the buyer should know whether the variety has many or few petals. Peace has 50 to 60 petals, and Mirandy 35 to 45. They are well adapted to moderately warm climates, and can be expected to have a good number of petals in spite of heat. Show Girl has 15 to 19 petals, and Sweet Sixteen has 16 to 18 petals.

Many roses of recent years have had too few petals to make for ideal exhibition, but their color and other characteristics have often made up for this one deficiency. The form of the buds may be good in spite of this fault. Most roses are judged when only partly opened; therefore, good buds are important, even though the flowers are less desirable when fully blown. However, if form of the flower is of prime consideration, as in exhibiting, the grower perhaps should avoid such varieties as Fred Edmunds and Grand Duchess Charlotte, whose forms are sometimes faulty. Similarly, too little foliage beneath the flower on varieties such as President Herbert Hoover makes them unsuitable for competition in a flower show.

Single roses may be very charming. Their simple design always has appeal. However, if anything happens to one of the 5 petals the flower is not suitable for exhibition. In a double rose, on the other hand, a faulty petal will not be such a serious handicap.

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Appendix

Table 1: ROSE PRODUCTION IN LEADING CALIFORNIA COUNTIES 1947

County	Greenhouse roses		Nursery stock		Total value
	Square feet	Estimated value of cut blooms	Number bushes	Estimated value*	
Alameda	1,819,000	$2,651,000	1,100,000	$ 500,000	$3,201,000
Los Angeles	435,600	437,000	3,905,000	1,643,500	2,081,000
Riverside	†	†	601,000	338,065	338,065
San Bernardino	†	†	1,589,980	3,360,000	1,589,980
San Mateo	250,875	338,065	†	†	338,065
Santa Clara	†	†	225,000	490,000	225,000

* The valuation of rose bushes may not be on the same basis but is given as reported by county agricultural commissioners. In some instances, bush roses were valued at 45 cents a bush and $1.25 for a standard rose.

† No figures reported. Many small plantings may not be included in the figures reported from some counties.

Table 2: SOME POPULAR SMALL ROSES ARRANGED ACCORDING TO HABIT OF GROWTH

Polyantha	Floribunda	Miniature
Cameo (shell pink)	Betty Prior (red)	Midget (patented; rose red)
Cecile Brunner (pink)	Bright Eyes (yellow)	Pixie (patented; pale pink)
China Doll (pink)	Donald Prior (cherry red)	Rosa Rouletti (deep pink)
Kirsten Poulsen (red)	Else Poulsen (rose pink)	Sweet Fairy (patented; apple-blossom pink)
Lafayette Improved (cherry; crimson; semidouble)	Floradora (geranium red)	Tom Thumb (patented; red)
Mrs. R. M. Finch (pink)	Glorious (Tyrian rose, golden centered)	
Perle d'Or (yellow)	Goldilocks (golden yellow)	
Pinkie (pink or neyron rose)	Margaret Koster (orange red)	
Poulsen's Yellow (yellow)	Ming Toy (red)	
Sunshine (golden orange)	Orange Triumph (scarlet orange)	
White Finch (white)	Pinocchio (pink)	
	Red Ripples (red)	
	Rosenelfe (pink)	
	Snowbird (white)	
	Summer Snow (white)	
	World's Fair (crimson)	

Table 3: SOME POPULAR BUSH* ROSES ARRANGED ACCORDING TO COLOR

White	Salmon pink	Flame and carmine	Copper shades
Frau Karl Druschki†	Cheer	Charlotte Armstrong†	Apricot Queen†
Innocence (almost single)	Comtesse Vandal† (mildews near coast)	Grand Duchess Charlotte†	Bright Wings (fine as standard)
Kaiserin Auguste Viktoria†	Good News	Irish Fireflame (single)	California†
McGredy's Ivory†	Horace McFarland†	Mme. Henri Guillot†	Duquesa de Peneranda†
Odine‡	Katherine T. Marshall‡	Tallyho (Dec. 1948—very promising)	Hinrich Gaede† (a little hard to grow)
Pedrables†	Los Angeles	Texas Centennial† (not the best for exhibition)	Mrs. Sam McGredy†
Snowbird	Mary Margaret McBride‡	The Chief†	
White Wings	Peach Blow‡		
	Shot Silk (stands some shade)		
	Sweet Adeline‡		
	Sweet Sixteen†		
	Treasure Island†		

Red prevailing	Yellow	Pink	Multicolored
Christopher Stone†	Cecile (single)	Charlotte	Ambassador
Crimson Glory†	Debonair‡	Commando	Angel's Mateau
Crimson King†	Diamond Jubilee	Dame Edith Helen†	Autumn
Dickson's Red	Eclipse†	J. Otto Thilow†	Condesa de Sastago†
Dr. Kirk	Fantasia	Katherine T. Marshall	Forty-niner (Dec. 1948)
E. G. Hill	Golden Dawn	Lulu	Fred Edmunds
Etoile de Hollande†	Golden Emblem	Mary Margaret McBride‡	Girona
Flash (climber)	Golden Harvest‡	Miss Clipper	Isobel (single)
Floradora (floribunda)	Golden Rapture	Mme. Butterfly	Peace
Heart's Desire	High Noon‡ (pillar)	Neville Chamberlain‡	Pres. Herbert Hoover†
Hoosier Beauty	Joanna Hill	Ophelia	Saturnia†
Lucia Zuloaga	Lady Forteviot	Picture†	Signora†
Mirandy†	Lowell Thomas	Pink Dawn	Taffeta (new)
Mrs. Miniver (excellent in some places)	McGredy's Yellow	Rapture	Talisman†
Night	Mme. Chiang Kai-shek	Santa Anita†	
Nocturne‡	Mme. Marie Curie	Show Girl†	
Piccaninny	Mrs. E. P. Thom†	Sonata‡	
Poinsettia	Mrs. Pierre S. Dupont	Sterling	
Rubaiyat	Narzisse	Susan Louise	
San Fernando	Sister Therese†	The Doctor	
Southport	Topaz		
Vesuvius (small single)	Ville de Paris†		
Victoria Harrington†			
World's Fair (floribunda)			

* Bush, unless otherwise indicated.
† Considered the most popular in 1948.
‡ A fine new variety.

Table 4: POPULAR CLIMBING ROSES OF CALIFORNIA

Name	Color
Banksia	white, yellow
Belle of Portugal	pink
Billy Boiler	deep red
Captain Thomas (single)	creamy yellow
Cecile Brunner	pink
Cherokee	pink, red, white varieties
Condesa de Sastago	gold and copper rose
Christopher Stone	velvety red
Countess of Stradbroke	red
Countess Vandal	coppery salmon
Dainty Bess (single)	soft amber pink
Douglas MacArthur	rose, gold, and salmon
Dr. John Gallwey (single)	white
Duquesa de Penaranda	coppery apricot and peach shades
Ednah Thomas	light pink
Etoile de Hollande	velvety dark red
Flash	orange scarlet
Golden Dawn	sunflower yellow
Golden Emblem	yellow
Golden Rapture	yellow
Gold of Ophir	old gold and apricot
Heart's Desire	crimson
High Noon (pillar rose)	yellow
Hinrich Gaede	orange vermillion
Hoosier Beauty	red
Indian Summer	copper, old rose, blush pink
Irish Fireflame (single)	apricot, terra cotta, and deep orange
J. Otto Thilow	rose pink
Kaiserin Auguste Viktoria	white
Lady Forteviot	reddish gold to apricot
Marechal Niel	lemon yellow noisette
Mary Hart	velvety red
Max Krause	yellow
McGredy's Ivory	white
Mermaid (single)	sulfur yellow
Mme. Butterfly	shell pink
Mme. Gregoire Staechelin	pink, shaded carmine
Mme. Henri Guillot	orange, coral, and red
Mrs. E. P. Thom	golden yellow
Mrs. Paul J. Howard	rich crimson
Mrs. Pierre S. Dupont	yellow
Mrs. Sam McGredy	coppery orange
Night	very dark red
Paul's Scarlet	scarlet red
Picture	pink
Pink Dawn	deep rose
President Herbert Hoover	cerise, flame, buff, and yellow
Rose Anne	orange apricot
Rose Marie	rose pink
Ruth Alexander	orange tints with deep rose shading
Shot Silk	copper pink with yellow
Silver Moon	creamy white
Sungold	golden yellow
Talisman	pink and gold
Texas Centennial	brick red to rosy red
Victoria Harrington	fluted petals of dark velvety red
Ville de Paris	light yellow

Table 5: SOME POPULAR STANDARD OR TREE ROSES*, ARRANGED ACCORDING TO COLOR

Red	Yellow	Pink and rose	White	Multicolored
Charlotte Armstrong	California	Countess Vandal	Kaiserin Auguste Viktoria	Angel's Mateau†
Christopher Stone	Eclipse†	Dainty Bess†	McGredy's Ivory	Best Regards
Crimson Glory	Lowell Thomas†	J. Otto Thilow	Snowbird	Bright Wings
E. G. Hill	Mme. Chiang Kai-shek†	Los Angeles	White Wings	Duquesa de Penaranda
Etoile de Hollande	Mrs. E. P. Thom	Lulu		Fred Edmunds
Grand Duchess Charlotte	Mrs. Pierre S. Dupont	Picture		Hinrich Gaede
Heart's Desire	Peace	Rose Marie		Lady Forteviot
Mirandy (needs much heat)	Ville de Paris†	Santa Anita		Mme. Chas. Mallerin
Poinsettia		The Doctor		Mme. Henri Guillot
Texas Centennial†				Mrs. Sam McGredy
				Orange Triumph
				Saturnia
				Shangri-la
				Sister Therese†
				Talisman
				The Chief
				Treasure Island

* The full standard roses are budded at a height of about 40 inches, while the half standard are budded at about 24 inches. Standards are often propagated on IXL or Ragged Robin, while the half standards are budded on Rosa odorata or Ragged Robin. Other stocks are used occasionally in California.

† Habit of growth too upright for best head.

Table 6: SOME POPULAR SINGLE ROSES

Name	Color
Captain Thomas (climber)	yellow
Cecil*	yellow
Dainty Bess*	pink
Innocence* (nearly single)	white
Irish Fireflame*	pink, bronze, and gold
Isobel	coppery pink
Mermaid (climber)	sulfur yellow
Piccaninny	new red
Vesuvius*	crimson

* This rose was considered the most popular in 1948.

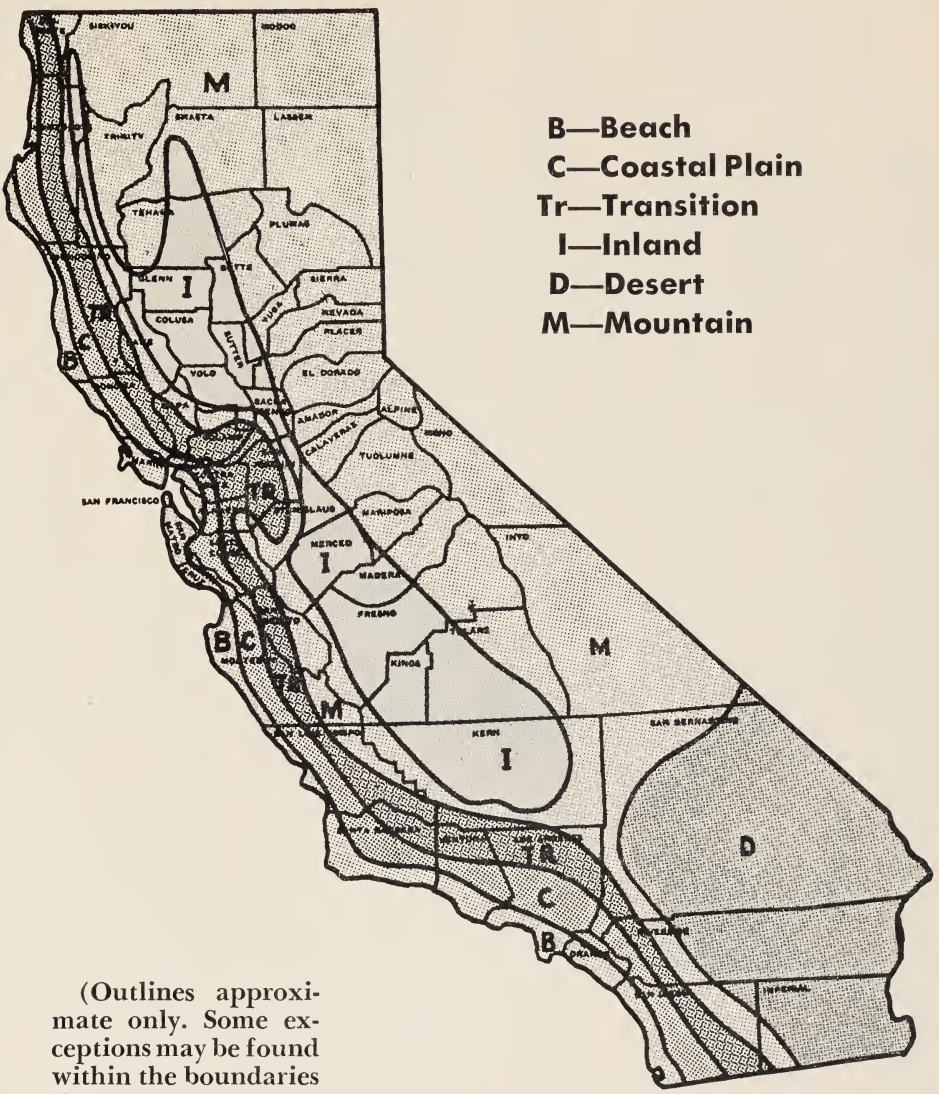
Table 7: ROSES GRANTED ALL AMERICA AWARD*

Rose honored†	Color	Year of award
Apricot Queen	orange and apricot to salmon rose	1940
California	orange and yellow tones, rose pink reverse	1940
Charlotte Armstrong	brilliant cerise	1941
Diamond Jubilee	light shades of buff, yellow, and pale orange	1948
Dickson's Red	scarlet red	1940
Flash (climber)	orange scarlet	1940
Floradora (floribunda)	geranium red	1945
Fred Edmunds	reddish apricot, aging to orange pink	1944
Grand Duchess Charlotte	tomato red shaded geranium red	1943
Heart's Desire	luminous red	1942
High Noon (pillar rose)	clear yellow	1948
Horace McFarland	salmon buff	1945
Katherine T. Marshall	pink suffused with gold	1944
Lowell Thomas	golden yellow	1944
Mary Margaret McBride	coral pink suffused with gold	1943
Mirandy	chrysanthemum red	1945
Mme. Chiang Kai-shek	lemon yellow	1944
Mme. Marie Curie	clear yellow	1944
Nocturne	cardinal red	1948
Peace	gold, buff, pearly white, and apple blossom	1946
Pinkie (polyantha)	neyron rose	1948
Rubaiyat	rose red to crimson	1947
San Fernando	brilliant red	1948
Taffeta	changeable pink and yellow tones	1948
The Chief	deep rose to flame, opening coral and copper	1940
World's Fair (floribunda)	deep crimson	1940

* In 1940, the All America Rose Selections began to accept rose entries for All America trial gardens scattered throughout the United States. Sixteen judges now score entries for a two-year period on a uniform point basis. The scores are averaged, and the top rose or roses are honored by an All America Award. Such awards are as nearly impartial as possible, and normally indicate roses of the highest merit. Local rose organizations can indicate which winners may not do well locally and which should be included among the best of the new introductions.

† Bush hybrid tea, except where otherwise noted.

California Rose Zone Map



(Outlines approximate only. Some exceptions may be found within the boundaries shown)

*Some Varieties of Roses Adapted to the Six Rose Zones of California**

Variety and petal number	Rate of bud opening	Beach	Coastal Plain	Transition	Inland	Desert	Mountain
MIRANDY 35–45	Slow	Poor	Poor. Fair in late fall	Good in fall only	Excellent in summer and fall	Excellent in spring and fall	Excellent in summer and fall
DIAMOND JUBILEE 45–55	Slow	Poor	Poor, except in late fall	Poor in spring. Fair in summer. Excellent in fall	Good in spring. Faded in summer. Fine in fall	Fine in spring. Faded in summer. Excellent in late fall	Fine in summer and fall
PEACE 50–65	Slow	Poor, except in late fall	Poor in spring and early summer. Good in fall	Poor in spring. Fine from July on until November first	Good in spring. Fair in summer. Fine in fall	Good in spring. Faded in summer. Fine in fall	Good in summer and fall
DEBONAIR 25–35	Medium rapid	Poor in spring. Good in late summer and fall	Poor in spring. Good in late summer and fall	Fair in spring. Good in summer. Excellent in fall	Good in spring. Fair in summer. Excellent in fall	Good in spring. Faded and small in summer. Fine in fall	Poor in spring. Fine in summer and fall
CHARLOTTE ARMSTRONG 20–25	Medium rapid	Fair in spring and summer. Good in fall	Fair in spring. Good in summer and fall	Good in all seasons. Excellent in fall	Good in all seasons. Excellent in fall	Good in spring. Poor in summer. Excellent in fall	Good in spring and fall
SAN FERNANDO 20–22	Medium rapid	Poor in spring. Fair in summer. Fine in fall	Fair in spring. Good in summer. Excellent in fall	Fair in spring. Good in summer. Excellent in fall	Fine in spring. Fair in summer. Good in fall	Fine in spring and late fall	Good in summer and late fall
GRAND DUCHESS CHARLOTTE 18–20	Medium rapid	Poor in spring. Fair in summer. Good in fall	Poor in spring. Good in summer and fall	Fair in spring and summer. Excellent in fall	Fine in spring. Poor in summer. Excellent in fall	Good in early spring and late fall	Good in spring and fall

SHOW GIRL 15–20	Medium rapid	Fair in spring. Excellent in fall	Fair in spring and summer. Excellent in fall	Good in spring. Fair in summer. Excellent in fall	Good in spring. Poor in summer. Excellent in fall	Good in spring. Poor in summer. Excellent in fall	Good in spring and fall
SWEET SIXTEEN 16–18	Rapid	Excellent in spring, summer, and fall	Good in spring and summer. Excellent in fall	Excellent in spring. Fair in summer. Excellent in fall	Good in spring. Poor in summer. Excellent in fall	Fair in spring. Poor in summer. Excellent in fall	Good in spring. Excellent in fall
LOWELL THOMAS 15–18	Rapid	Good in spring. Fair in summer. Excellent in fall	Good in spring and summer. Excellent in fall	Excellent in fall or spring. Poor in summer	Good in spring. Poor in summer. Excellent in fall	Fair in spring. Poor in summer. Excellent in fall	Good in spring. Faded in summer. Excellent in fall
HIGH NOON 15–20	Rapid	Fair in spring. Good in summer and fall	Good in all seasons	Excellent in spring. Fair in summer. Fine in fall	Good in spring. Poor in summer. Excellent in fall	Fine in spring. Poor in summer and early fall	Fine in spring and fall
ECLIPSE 10–22	Rapid	Fine in spring, summer, and fall	Fine in spring. Faded in summer. Excellent in fall	Fine in spring. Faded in summer. Excellent in fall	Fine in spring. Faded in summer and early fall. Good in late fall	Excellent in very early spring and late fall. Faded in summer	Fine in spring and fall
KATHERINE T. MARSHALL 15–20	Rapid	Good in all seasons	Good in all seasons	Good in spring. Fair in summer. Excellent in fall	Good in spring. Poor in summer and early fall. Fine in late fall	Fine in spring. Poor in summer until very late fall	Fine in fall

* Prepared by Walter E. Lammerts, La Cañada, California.

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Court House, Yreka

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Court House, Santa Rosa

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Federal Bldg., Modesto

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Post Office Bldg., Yuba City

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Federal Bldg., Red Bluff

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County Office Bldg., Weaverville

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Post Office Bldg., Visalia

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